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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/882,734

06/13/2001

Shih-Jong J. Lee

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06/23/2004

SHIH-JONG J. LEE
15418 SE 53RD PLACE
BELLEVUE, WA 98006

EXAMINER

STREGE, JOHN B

ART UNIT

PAPER NUMBER

2625

DATE MAILED: 06/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/882,734

Applicant(s)

LEE ET AL.

Examiner

John B Strege

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20-25 is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☒ Claim(s) 17-19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 recites the limitation "the alignment parameter input" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Examiner assumes that claim 3 was meant to be dependent on claim 2, and the rejection takes into account this assumption. However, the antecedent basis error should be corrected accordingly.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-3, 8, 10-11, and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Nguyen et al. USPN 6,748,112 (hereinafter "Nguyen").

Claim 1 discloses, "a structure-guided automatic alignment system for image processing comprising: (a) means to receive an image input; (b) means to receive an application domain structure input; (c) a structure estimation module having an estimated structure output processes the image input and the application domain structure input."

As seen in figure 1 Nguyen discloses an input image 22, and a reference image 30 that are input into a processor 36 that aligns the centers of gravity and the moments of inertia of the surface data points of the image and the corresponding reference image (col. 6 lines 50-55). Nguyen discloses that the reference images may be derived from known defect-free products and reference images generated from design data, such as CAD models. This CAD data is read as application domain structure input.

Regarding claims 2-3, as seen in figure 2 the processor 36 roughly aligns the scanned data points with the CAD model. This rough estimate is then used to finely register the scanned data with the CAD model as seen in step 56 (col. 6 line 50 – col. 7 line 13). Further disclosed in the paragraphs cited (col. 6 line 50 – col. 7 line 13) is that parameters are used from the estimate in order to align the CAD data to the scanned data. These alignment parameters are done within the processor 36.

Regarding claim 8, Nguyen discloses in figure 1 a patch determining device 32 (read as a preprocessing module for reasons discussed below) that receives the image input and has a preprocessed image output, and a deformation estimator 28 (read as

the distributed estimation module) that receives the preprocessed image and the reference image and estimates the structure of the object. The patch determining device 32 computes low curvature patches off-line and scores the low curvature patches in the image register 24 for registration with the object 12 at a later time (col. 5 lines 30-36). Thus the patch determining device is a preprocessing module.

Claim 10 discloses a sub-region generation module having a sub-regions output and an estimation module that receives the output having an estimated structure output. Nguyen discloses a segmentor 38 that creates sub-regions that are output to the constraint device 44 that adds leading edge constraints and platform constraints to the registration (col. 6 lines 33-35).

Claim 11 discloses similar limitations to those already discussed above for claim 8 and therefore is rejected for the same reason.

Claim 13 discloses similar limitation to those already discussed for claim 10 and therefore is rejected for the same reason.

5. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Aloni et al. USPN 5,586,058 (hereinafter "Aloni").

Aloni discloses an alignment apparatus that includes a first apparatus for comparing a portion of the inspected object to corresponding portion of a reference thereby to provide an output indication of misalignment (col. 7 lines 13-20). Further disclosed is a second apparatus for receiving the output indication of misalignment

from the first apparatus and for aligning the corresponding portions of the inspected object and the reference object (col. 7 lines 20-24).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. USPN 6,748,112 in view of Fix et al. (hereinafter "Fix").

Claim 4 discloses that the application domain structure of claim 1 is specified using a caliper method. As discussed Nguyen discloses CAD models or data from a defect-free reference as the application domain structure but does not explicitly disclose a caliper method.

Fix teaches that information relating to the features of objects can be obtained using other vision tools, including an edge detection tool such as the Cognex Caliper Tool, a CAD tool, or other machinery that requires, or acquires, and has information relating to the characteristics of interest (col.9 line 63 – col. 10 line 3).

Nguyen and Fix are analogous art because they are from the same field of endeavor of using modeled parts or CAD data.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Nguyen and Fix in order to obtain the application domain structure through the use of a caliper method. Nguyen discloses obtain a model of the object through any known method including CAD or from a defect-free object. Fix discloses that there are many ways of providing this model including a caliper method, thus giving motivation for using the caliper method to find a good reference model. Therefore it would have been obvious to one of ordinary skill in the art to combine Nguyen and Fix in order to obtain the invention as specified in claim 4.

8. Claims 5 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. USPN 6,748,112 in view of Fix et al. and further in view of Engel et al. USPN 5,371,690 (hereinafter "Engel").

As discussed above the combination of Nguyen and Fix discloses the limitations of claim 4. Neither Nguyen nor Fix disclose a directional box caliper.

Engel discloses using a Cognex Caliper (also disclosed by Fix) and as can be seen in figure 11 there are directional box calipers (col. 7 line 22- col. 8 line 8).

Nguyen, Fix, and Engel are analogous art because they are all from the same field of endeavor of using modeled parts or CAD data.

The motivation for combining Nguyen and Fix has already been discussed. Fix does not go into details of the Cognex Caliper but merely mentions that it may be used. Engels provides the details of the Cognex Caliper, thus the motivation for combining

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Nguyen, Fix, and Engels is that Engels provides the details as to how the Cognex Caliper works.

Claim 14 discloses similar limitations to claim 5, thus the same arguments applied for claim 5 apply equally to the rejection of claim 14.

9. Claims 6-7, and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. USPN 6,748,112 in view of Fix et al. and further in view of Schott USPN 5,818,443.

As discussed above the combination of Nguyen and Fix discloses the limitations of claim 4. Neither Nguyen nor Fix disclose a circular or arc caliper.

Schott discloses course registration and inspection of circular objects where fine fixturing of the circular objects is achieved rapidly by means such as vision caliper software, e.g. the Caliper Tool sold by Cognex which effects the function of mechanical caliper as known in the art (col. 1 lines 28-43).

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Nguyen, Fix, and Schott in order to obtain an inspection device that uses circular calipers. The motivation for doing so would be to permit the system to work equally well with circular objects as is stated by Schott. Fix discloses using a Cognex Caliper and Schott discloses one type of Cognex caliper that works for circular objects. Therefore it would have been obvious to one of ordinary skill in the art to combine Nguyen, Fix, and Engels to obtain the invention as specified in claim 6.

Claim 7 discloses an arc caliper. As discussed above Schott discloses a method for inspection circular objects It would have been obvious to one of ordinary skill in the art to only inspect use an arc caliper with the motivation of only inspecting a region of interest of a circular object, therefore Official Notice is declared by the Examiner.

Claims 15-16 disclose similar limitations to claims 6-7, thus the same arguments applied for claims 6-7 apply equally to claims 15-16.

10. Claims 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. USPN 6,748,112 in view of Maali et al. USPN 5,694,482 (hereinafter "Maali").

As discussed above Nguyen discloses the limitations of claim 8, and discloses a preprocessing step looking for low curvature patches. Edges of an object would be a type of low curvature object that is detected by the device however, however Nguyen does not explicitly disclose performing edge detection. Maali discloses a system for aligning an image with a reference that involves a preprocessing step 103 (figure 1B) that reduces the incident image to directional edgels (col. 5 lines 57-58). This allows for extracting the location of the image with respect to the reference in a simplified manner.

Nguyen and Maali are analogous art because they are from the same field of endeavor of comparing an actual image to a reference image.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Nguyen and Maali in order to detect the edges of features. Nguyen discloses finding patches of low curvature which correspond to edges, and Maali

discloses finding edges to simplify the comparison. Thus the motivation for combining is that finding the edges allows for an easier comparison between the image and the reference. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Nguyen and Maali to obtain the invention as specified in claim 8.

Claim 12 is similar to claim 9 and as discussed Nguyen discloses the same limitations of claim 11, thus the rejection of claim 12 is similar to the rejection of claim 9.

Allowable Subject Matter

11. Claims 20-25 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: Regarding claim 20, none of the prior art disclose a robust feature direction estimation and weight adjustment method for a group of box caliper sub-regions comprising: comparing the estimation of the feature direction using line estimation without constraint, followed by estimating the feature direction using line estimation constrained by a parallelism relation for each subregion. The closest prior art is Cullen et al. USPN 5,805,722 (hereinafter "Cullen") that uses calipers for coarse location of a lead set wherein the center and angle of a lead scan search rectangle is found (at least in the abstract and col. 2 lines 53-60). This is used to update the part location estimate (col. 3 lines 3-5). Cullen further discloses a stepped scan consisting of several calipers aligned with the image that cover the lead scan search rectangle (col. 2 lines 61-65). However, as Cullen fails to disclose the limitations stated above, this claim is allowable.

Claims 21 and 22 are similar to claim 20 except they are for circle caliper and arc caliper sub-regions. Cullen fails to disclose these limitations, therefore they are allowable.

Claims 23-25 are dependent on claims 20-22 and are therefore allowable for the same reasons.

12. Claims 17-19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B Strege whose telephone number is (703) 305-8679. The examiner can normally be reached on Monday-Friday between the hours of 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



**BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600**